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ABSTRACT

Research shows that the labor market payoff to vocational education in high school is quite large when graduates work in the occupation for which they trained. Less than one-third of those who learn occupationally specific skills get training-related jobs. The occupationally specific skills learned are seldom used on a job due to lack of emphasis on placement, insufficient involvement of employers, and training for jobs not in demand. High school vocational education has no significant positive or negative effects on the noneconomic aspects of schooling. Vocational education lowers dropout rates, but not dramatically. Basic skills cannot substitute for occupational skills. Skill obsolescence is less important than the risk of not using and forgetting skills. Studying occupationally specific skills does not necessarily lower academic achievement if nonrigorous academic courses are sacrificed. Most occupationally specific skills are best taught on the job. For vocational educators, the five most important policy implications are as follows: taking responsibility for and giving priority to graduate placement; involving employers more directly in vocational education delivery; ensuring that a well-informed career choice precedes entry into intensive occupational training; offering training in occupations for which there is substantial employer demand; and establishing a system whereby the school vouches for its students' accomplishments. (Appendixes include 23 footnotes and 46 references). (YLB)

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The Impact of High School Vocational Education: A Review with Recommendations for Improvement

John Bishop

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TABLE OF CONTENTS

	Page
PART I REVIEW OF RESEARCH	4
1. How Large are the Economic Benefits of Vocational Education and What Causes Them?	4
2. To What Extent are th Occupationally Specific Skills Learned in High School Being Used?	7
3. Why Are the Occupationally Specific Skills Learned So Seldom Used On A Job?	9
4. Does Vocational Education Generate Non-economic Benefits	12
5. Does Vocational Education Lower the Dropout Rate?	14
6. Can Basic Skills Substitute for Occupational Skills.	15
7. Have High Rates of Skill Obsolescence Drastically Lowered the Return to Occupationally Specific Training	17
8. Does Studying Occupationally Specific Skills in School Necessarily Lower Achievement in the Academic Arena?	20
9. Are Occupationally Specific Skills Best Learned in a Classroom or On-a-Job?	23
PART II POLICY IMPLICATIONS	26
1. State Funding Formulas	30
2. A Strong Basic Skills Foundation	33
3. Cooperative Education.	34
4. Counseling Before Entry into Occupationally Specific Programs	35
5. Aiding Students in Their Search for Work	37
6. Rewarding Successful Placement	38
7. Closing Remarks.	40
FOOTNOTES	42
REFERENCES.	47

THE IMPACT OF HIGH SCHOOL VOCATIONAL EDUCATION: A REVIEW WITH RECOMMENDATIONS FOR IMPROVEMENT

About half of all youth either do not complete high school or end their formal education with the high school diploma. Even higher proportions of minority, disadvantaged and handicapped youth do not enter postsecondary education. Should public schools offer these youth occupationally specific education and training? If so, what form should this education take? Should the goal of the occupational component of high school vocational education be occupationally specific skills, career awareness, basic skills or something else? What role should employers play in the occupationally specific training provided or sponsored by high schools?

In addressing these issues it is important to know how taking occupationally specific courses influences dropout rates, probabilities of employment, wage levels, productivity, access to additional education and training, job satisfaction, basic skills, citizenship, and other positive traits of character. It is also important to understand the relative effectiveness of alternate vocational education programs in achieving these goals. The first part of the paper is a review of what current research tells us about these issues. The review is organized around 9 questions. The questions and the corresponding findings are listed below:

Questions and Answers

1. How large are the economic benefits of occupationally specific education and what causes them? **(A) Economic benefits are zero if a training related job is not obtained. If a training related job is obtained, monthly earnings are 7-10% greater and unemployment is substantially reduced.**

2. To what extent are the occupationally specific skills learned in high school being used? **(A) Less than 1/3 get training related jobs (rigorously defined).**

get training related jobs (rigorously defined).

3. Why are the occupationally specific skills learned so seldom used on a job? **(A) Lack of emphasis on placement, insufficient involvement of employers, training for jobs not in demand.**

4. Does vocational education generate non-economic benefits? **(A) There is no evidence that it either increases or decreases non-economic benefits relative to a general curriculum.**

5. Does vocational education lower dropout rates? **(A) Yes, but not dramatically.**

6. Can basic skills substitute for occupational skills? **(A) No, jobs require both.**

7. Have high rates of skill obsolescence drastically lowered the payoff to occupationally specific training? **(A) No. Obsolescence is less important than the risk of not using and forgetting skills.**

8. Does studying occupationally specific skills in high school necessarily lower achievement in the academic arena? **(A) No, not if nonrigorous academic courses are sacrificed. Yes, if rigorous academic courses are sacrificed.**

9. Are occupationally specific skills best learned in a classroom or on-the-job? **(A) Most skills are best taught on-the-job but getting employers to do general training is difficult.**

The research clearly implies that occupationally specific education has a very positive impact on labor market success when training related jobs are obtained. If jobs are not related to training, high school graduates receive no economic or noneconomic benefits from their vocational education. The productivity enhancing effects of vocational education also occur only when the job occupied is related to the training. Taking vocational education courses lowers the dropout rate of students at risk of dropping out, but even here it's holding power probably derives largely from the student's hope that occupational studies will improve the jobs he/she can get. Unfortunately, less than one-third of the graduates of high school vocational

programs who did not go to college, work in occupations that match (very broadly defined) their training. Training related placement rates vary greatly from program to program and much of the variation can be explained by features of the vocational educational program. The most important program feature is vocational teachers (not placement directors) taking responsibility for and devoting time to the placement of their students.

The policy implications of these findings are discussed in the second part of the paper. For vocational educators in the field the five most important recommendations are (1) taking responsibility for and giving priority to the placement of graduates, (2) involving employers more directly in the delivery of vocational education, (3) insuring that a well informed career choice precedes entry into intensive occupational training, (4) only offering training in occupations for which there is substantial employer demand, and (5) establishing a system whereby the school vouches for the accomplishments of its students. For state level administrators of vocational education there is just one recommendation: the allocation of state aid for vocational education by a formula that rewards success in serving students, rather than just success in recruiting them and that offers greater rewards for success with more challenging students.

PART I REVIEW OF RESEARCH

1. How Large are the Economic Benefits of Vocational Education and What Causes Them?

Student Benefits of High School Vocational Education

The effect of high school vocational education on wage rates and earnings has been extensively studied in the last decade. The consensus of the research is that for women commercial training has substantial positive effects on the earnings, but technical and home economics training has either

zero or negative effects on earnings (Grasso and Shea, 1979, Meyer, 1982, Gustman and Steimeier, 1981). For men the results are less favorable. Campbell, et. al. (1986) summarized the literature by saying "The evidence is mixed as to whether male vocationally educated high school graduates (especially white men) earn significantly more per hour or per week than otherwise similar nonvocational graduates" (p. 13). The National Commission for Employment Policy (1981) concluded that "most studies based on nationally representative samples of students could not find convincing evidence of positive labor market effects of secondary vocational education on males, compared to alternative uses of student's time" (p. 15).

Recent research by Campbell, et. al. (1986) and Daymont and Rumberger (1982) have discovered why the overall impact of vocational education is so small. For graduates who use the training on their job, these two studies demonstrate that vocational education has large positive effects on the earnings of both men and women. The reason overall impacts are so small is that the majority of vocational graduates do not get training related jobs. Table 1 summarizes Campbell, et al's analysis of data from two nationally representative longitudinal surveys, High School and Beyond, and the National Longitudinal Survey. Vocational graduates who obtain a job in an occupation matching (broadly defined) their field of training spend about 20 percent more time in the labor force than general track graduates. Their rates of unemployment are about 3 percentage points lower. Vocational graduates working outside their field of training are not significantly more likely to be in the labor force or to be employed than general track graduates.

The third and fourth columns of the table present estimates of the effect

Table I

THE ECONOMIC EFFECT OF VOCATIONAL EDUCATION

(Relative to Graduates Who Pursued a General Curriculum)

OUTCOMES

Groups In Comparison to General Curriculum	Labor Force Participation	Unemployment	Monthly Earnings	Monthly Earnings
Vocational Grads				
Training Related	20%***	-3*	7%**	10%**
Not Training Related	2%	1	3%*	-1%
Academic Grads	-9%***	1	-5%*	-4%*

Source: Table 14 and 16 of Campbell, Basinger, Dauner, and Parks, Outcomes of Vocational Education for Minorities, the Handicapped and the Poor. The classification of students into vocational, academic and general was based on the high school transcript. A graduate was in a training related job when the occupation matched (liberally defined) the field for which she trained. Results reported are averages of coefficients on concentrator, limited concentrator and concentrator explorer. For the labor force participation model the value presented in the table are the estimated coefficients divided by the mean labor force participation rate. Coefficients from regressions predicting the log of monthly earnings have been multiplied by 100 to approximate percentage impacts. The regressions included controls for the following: sex, minority status, handicapped, limited English proficient, test scores, grade point average, family background, attitudes, past and present college attendance, employment during high school, aspirations in 8th grade, region, rural/urban. The fourth column reports analyses of NLS data. The first 3 columns are based on HSB data and contain additional controls for presence of a spouse or child, absenteeism and discipline problems in high school. The monthly earnings models control for labor market experience and tenure on ones current job. The HSB model of monthly earnings also contained controls for occupation. The average significance level of the coefficients are indicated by the number of stars. *** is significant at the .01 level using a two tail test. ** is significant at the .05 level. * is significant at the .10 level.

of vocational education on monthly earnings. High school graduates who took a vocational concentration obtain significantly higher monthly earnings (7 to 10 percent higher depending on the data set) only when their job is related to their training. When their job is not related to their training, they do not receive higher wage rates than students who have pursued a general program of study in high school.[2]

Effects on Productivity and Training Costs

Workers with 12 or fewer years of schooling account for the bulk of the nation's blue collar, sales, clerical and service workers. The training requirements and intellectual demands of many of these jobs are quite considerable. In clerical jobs, for instance, the time and resources devoted to training a new employee during the first 3 months on a job has a value equal to 45 percent of the output of a worker with 2 years of tenure at the firm. Training costs during the first 3 months are 36 percent of an experienced worker's potential output for retail sales jobs, 38 percent for blue collar jobs and 25 percent for service jobs (Bishop, 1985). Presumably the graduates of vocational programs are more productive workers and require less training. How large are these effects?

Studies of this issue find that vocationally trained workers are somewhat more productive and less costly to train than other workers doing the same job but only when the job is related to their training. The evidence for this statement comes from statistical comparisons of two workers doing the same job.[3] The data are presented in table 2, which has been summarized from Bishop (1982). Compared to those without vocational training, new hires who have received school provided vocational training that is relevant to their job required 7.3 percent more training during the first 3 months on

TABLE 2

IMPACT OF VOCATIONAL EDUCATION
ON TRAINING COSTS AND PRODUCTIVITY

(Percentage Difference From Members
Without Vocational Training)

OUTCOMES	RECEIVED VOCATIONAL TRAINING IN A SCHOOL	
	Relevant to Job	Not Relevant to Job
OJT Time	-7.3%	6.3%
Productivity		
in first 2 weeks	8.6%**	-3.0%
in next 10 weeks	6.1%**	- .5%
At present or when the employee separated	6.6%***	1.4%

**Impact of relevant vocational education is significantly larger than the impact of non-relevant vocational education at the .05 level (two-tail test)

***Impact of relevant vocational education is significantly higher at the .01 level (two-tail test)

Source: Table 5 of Bishop The Social Payoff from Occupationally Specific Training. High school vocational graduates account for only about 30 percent of the vocationally trained workers in the sample. Most of the rest received their training at a 2-year postsecondary institution.

the job. Those with relevant training were 8.6 percent more productive in the first two weeks, and 6.1 percent more productive during the next 10 weeks and 6.6 percent more productive after a year or so at the firm. Those with non-relevant vocational training were less productive initially and insignificantly 1.4 percent more productive after a year at the firm.

Summary: The labor market payoff to vocational education in high school is quite large when the graduate works on the occupation for which he/she trained. It is zero when the graduate works in other occupations. These findings imply that the private and social benefits of vocational education derive from the occupationally specific skills that are developed. Some of the skills taught in vocational classes are transferable--useful in a great variety of occupations--but skills taught in nonvocational classes are transferable as well. Vocational classes are no better at instilling valuable transferable skills than nonvocational classes. In other words, vocational education as now practiced does not do a better job of preparing youth for generic jobs than more academic forms of education. There may be ways of delivering vocational education that do a better job of teaching character or generic skills than an academic education but these programs are not common enough to affect statistics on the aggregate impact of vocational education.

2. To What Extent are the Occupationally Specific Skills Learned in High School Being Used?

During their four years in high school, 1982 graduates took an average 2.3 Carnegie units of exploratory vocational courses (industrial arts, home economics, typing I, etc.), 2.1 units of occupational vocational courses and 17.2 units of other courses. Twenty-seven percent of these graduates

described themselves as specializing in a vocational field, and they obtained 2.8 units in exploratory vocational courses, 3.7 Carnegie units in occupational vocational courses and 14.9 units in other areas (table 3.3, The Condition of Education, 1984). This implies that the 73 percent of students who report they are not specializing in a vocational field account for 67 percent of the students in exploratory courses and 52 percent of the students in occupational courses.

How frequently do students use and therefore benefit from their occupationally specific training? Twenty eight percent of the graduates who have taken 2 or more occupational vocational courses in a specific area (the concentrators, limited concentrators and concentrator explorers of the typology developed in Campbell, Orth, and Seitz 1981) enter a four-year college or university after high school (unpublished tabulation of 1983 NLS Youth provided by Paul Campbell). It is not clear how many of these graduates major in subjects which make use of knowledge and skills obtained in vocational courses.

What about the students who seek jobs immediately after graduating from high school? The empirical work reported in the previous section classified a youth as having a training related job when the individual's current occupation matched his/her field of training. By this definition, only 27.4 percent of the employed graduates who had been out of school between one and ten years currently had a training related job (very broadly defined) in the 1983 National Longitudinal Survey of Youth. By this same definition only 21 percent of employed vocational graduates had a training related job two years after high school graduation in High School and Beyond data (Campbell, et al. 1986). Other studies using the same methodology obtain

similar results.[4] Felstehausen's (1973) study of 1971 vocational graduates in the State of Illinois found training related placement rates of 27 percent in business occupations, 17 percent in trade and industry, 52 percent in health and 20 percent in agriculture. Conroy and Diamond's study (1976) of Massachusetts graduates obtained a training related placement rate of 29 percent for business and 37 percent for trades and industry. In contrast, 6 months after passing a German apprenticeship examination, 68 percent of those with civilian jobs were employed in the occupation for which they were trained (much more narrowly defined) (the Federal Institute for Vocational Training, 1986).[5]

Summary: Less than a third of the employed graduates of high school vocational programs have jobs that are related to their field of training.

3. Why Are The Occupationally Specific Skills Learned So Seldom Used On A Job?

In 1980 the National Center for Research in Vocational Education undertook a massive study of the determinants of training related placement rates (McKinney et al, 1982; Lewis et al, 1982). Controlling for the local unemployment rate and the congruence of school and community racial composition, Lewis et al (1982) found that training related placement rates were higher when vocational teachers accepted responsibility for placement, when they spent considerable time on placement, when admission to the program was restricted and when career exploration was an important part of the program.

Other research suggests that another important cause of the problem is the limited employer involvement in the training. Mangum and Ball (1986) have found in their analyses of NLS data that employer controlled training

institutions have much higher training related placement rates. Using a procedure of matching training fields against jobs, they found that the proportion of male graduates who had at least one job in a related field was 85 percent for company training, 71 percent for apprenticeship, 52 percent for vocational-technical institutes, 22 percent for proprietary business colleges and 47 percent for military trainees who completed their tour of duty. The rates for females were 82 percent for company training, 59 percent for nursing schools, 61 percent for vocational-technical institutes, 55 percent for proprietary business colleges and 49 percent for military training.

The graduates who do not find training related jobs often complained that no such jobs were available. Aggregating the data from 3 different follow up studies, Mertens et al (1980) report that 25 percent said no job was available in an area related to training, 11 percent said their high school training was insufficient and 10 percent said they couldn't earn enough money in a related field. These statistics suggest that occupational training needs to be sensitive to the market both in the selection of and design of training programs.

Poor career guidance is apparently contributing to the problem for 21 percent said they left the field because they didn't like the work, another 2 percent said they didn't know what the job was really like and 5 percent said they switched fields when they got training in the military or at a postsecondary institution.

Some of the students apparently take occupational courses without having real plans to pursue a related occupation. Counselors and vocational teachers report that some of the students taking vocational courses are there to avoid

more difficult academic subjects or to get permission to take a job during part of the school day. Others apparently changed their career goals. Still others use the courses as a vehicle for career exploration (something for which they are often not really designed).

Still another reason why many high school graduates are unsuccessful in finding good jobs is that schools quite often ignore their requests for even the most minimal assistance in their job search -- for example, sending transcripts to prospective employers. To get a good job one must stand out in the crowd of applicants. Since more than 10 people apply for the typical job, being average is not good enough. A recent high school graduate cannot hope to compete for the better jobs if schools deny employers access to reliable information on a student's performance in high school. If employers know nothing about a student's high school accomplishments, work experience will inevitably become the primary hiring criterion and recent graduates will be at a disadvantage. When high school grade point average is entered on a job application, it has a greater impact on employer ratings of the attractiveness of particular job applicants than any other single factor including whether the youth had a high school diploma and various descriptors of the extent and nature of previous work experience (Hollenbeck and Smith, 1984).

The Buckley amendment requires school officials to share transcripts with employers when a student or graduate signs a release. Yet many schools fail to respond to the signed releases sent by employers. For example, Nationwide Insurance, one of the most respected employers in Columbus, Ohio sent 1200 requests for transcript information to local high schools in 1982 and received only 93 responses. Only 20 of these responses provided all

the information requested. When school officials were asked why they were not responding to the requests, the answer was that they were too busy.[6] Postsecondary institutions were reported to be much more cooperative in providing transcript information. Students headed for college are clearly receiving preferential treatment, for schools seldom fail to respond to a student's request that a transcript be sent to a college. The students who look for work after high school are not informed of their school's unwillingness to aid their job search by providing transcript information and probably do not realize that their inability to get quality jobs is due in part to this policy. Because high school transcripts are so difficult to obtain and are also slow to arrive, most employers have given up requesting them.

Summary: Placement rates are a function of both the strength of demand in the local labor market and the nature of the high school vocational education program. Training related placement rates were highest when teachers believed they were responsible for placement and devoted time to the task, when entry to the program was somewhat selective and when employers ran the training program. Another barrier to recent high school graduates getting good jobs is the unwillingness of many schools to comply with students' requests to send transcripts to employers.

4. Does Vocational Education Generate Noneconomic Benefits?

Some of the leading experts on vocational education argue that occupationally specific training is really intended to achieve a much broader purpose than preparation for a specific cluster of occupations. Harry Silberman (1982), for instance, feels the primary purpose of secondary vocational education is:

> "to promote full human development through exposure of the learner to work experience as part of the education process . . . . The purpose of the work is to further the education of the student; the work is subordinate to the education process; it is work for education" (p. 299)

If this goal were being achieved, we would expect (a) students to benefit from their vocational education regardless of whether they find a job in the field for which they are trained and (b) vocational students to receive noneconomic as well as economic benefits from their education. However, we have seen in section 1 that sadly, the students who take occupational courses and the employers who hire them do not benefit economically when students take jobs unrelated to the occupation for which training was received.

What about non-economic outcomes such as participation in organizations, political involvement and job satisfaction? Campbell, Mertens, Seitz and Cox (1982) found that neither taking vocational courses nor finding a training related job appeared to have a significant impact on job satisfaction.[7] Campbell and Basinger (1985) found that vocational students were less likely to participate in most types of school and non-school youth organizations than students in the general curriculum. After graduating they were also 6 percentage points less likely to register to vote, 9.5 percentage points less likely to have voted in the last 3 years and 2.8 percentage points (10.1 rather than 12.9 percent) less likely to engage in a political activity such as making a campaign contribution. The lower rates of political participation of vocational graduates appear to be due to their social background, not the vocational program. When controls are entered for years of schooling and social background, high school vocational education appears to have no unique effect on political participation. It also appears to have no

significant effects on views regarding whether women should work.

Summary: Most studies have found no significant positive or negative effects of high school vocational education on the non-economic outcomes of schooling. Until new evidence is uncovered which contradicts this finding, the case for vocational education should probably rest on its ability to improve the employability and productivity of its students.

5. Does Vocational Education Lower the Dropout Rate?

The second way occupationally specific education may be benefiting students is by persuading them to stay in school long enough to graduate. High school diplomas enhance earning power so students who have been induced to stay in school benefit even if they earn no more than graduates of a general program.

It is very difficult, however, to determine whether vocational education lowers the dropout rate because students who are at "higher risk of dropping out and dislike academic subjects tend to be attracted to the program. This means that vocational education's effects on retention cannot be measured without thoroughly controlling for grades, academic ability, alienation from school and a host of other background characteristics.

Using a longitudinal data set which contained controls for many of these variables, Mertens, Seitz and Cox (1982) found that taking and passing a vocational course in 9th grade significantly lowered the dropout rate of dropout prone youngsters during 10th grade (from about 9 to 6 percent). Taking one vocational course during each of the 3 preceding years lowered the 12th grade dropout rate from about 20 to 14 percent. The dropout rate during the 11th grade was not affected by taking vocational education in 10th grade. These results imply that consistently taking and passing one

vocational course each year from 9th through 11th grade raises the high school completion rate of dropout prone youngsters from about 64 to 70 percent. Their equations predict that two vocational courses per year for 4 years would have raised the completion rate to about 76 percent.

Summary: While the effects are not large, the limited evidence available suggests that taking vocational education courses does help some dropout prone students to complete high school.

6. Can Basic Skills Substitute for Occupational Skills?

If choices have to be made, what priority should be given to basic skills and what priority should be given to occupational skills? Basic skills--the ability to read, write, speak, compute and reason--are essential to almost everything a person does. Occupational skills are useful primarily at work and only when there is a correspondence between one's occupational skills and one's job. This suggests that occupationally specific training should occur after a career has been at least tentatively selected. Can one postpone career choice until graduation? Would it be feasible to concentrate solely on basic skills expecting that they would substitute for occupational skills when a career is later selected?

A review of research by industrial psychologists on the relationship between productivity in particular jobs and various predictors of that productivity is helpful in thinking about this issue. This research has found that direct measures of both basic skills (general mental ability tests) and occupational skills (job knowledge tests) have very large associations with reported productivity (Hunter and Hunter (1984) and Reilly and Chao (1983).[8] General mental ability (GMA) tests (such as the Armed Forces Qualification Test, the Scholastic Achievement Test and components of the

Employment Service's General Aptitude Test Battery) focus on verbal, quantitative, spatial, and reasoning abilities. Thus, they test many of the competencies that are the prime objectives of schooling. School attendance has been shown to improve performance on these tests (Lorge 1945). Increases in the quality and quantity of education were probably responsible for the increase between World War I and World War II of one standard deviation in the average test scores of army draftees (the equivalent of 110 SAT points).

The ability of GMA tests to predict job performance is greatest in jobs that are intellectually demanding. Apparently many of the jobs that students enter after completing high school make considerable demands on what has come to be called basic skills, for GMA test validities are quite high for clerical workers (.54), for service workers (.48), skilled trades and crafts (.46), for protective service workers (.42) and even for semi-skilled factory jobs (.37).[9] A validity of .54 implies that a one standard deviation difference in true ability is associated with .54 of a standard deviation difference in true performance. Since the standard deviation of worker productivity is about .2 (Schmidt and Hunter 1983), we can estimate that the effect of a 110 point higher score on both math and verbal SAT is associated with a 9-11 percent improvement in productivity for clerical, skilled trades and crafts and service jobs and an 8 percent improvement for semi-skilled factory jobs.

When, however, job knowledge (occupational skills) tests appropriate for the job compete with GMA (basic skills) tests in predicting job performance measured either by supervisory ratings or actual work samples, the job knowledge tests have the greatest impact (Hunter 1983). When GMA is held constant, a one standard deviation improvement in job knowledge raises

productivity by about 10 percent. When job knowledge is held constant, a one standard deviation improvement in GMA raises productivity by about 5 percent. Large improvements in job knowledge are easier to achieve than equivalent (in proportions of a standard deviation) improvements in basic skills. Thus while basic skills are important, there would seem also to be an important role for occupationally specific training. The research suggests that basic skills and GMA make their greatest contribution by helping the worker learn the job and occupation specific skills that are used to do the job.

Summary: On a job, basic skills are not a substitute for occupational skills. Studies that have examined the influence of basic and occupational skills on job performance find that occupational skills have a larger direct impact on productivity than basic skills. Basic skills and occupational skills are both essential. Occupational skills and knowledge are essential because of their large direct effects on productivity. Basic skills are important partly because they also contribute to productivity directly but primarily because they aid the learning of job specific and occupational skills.

7. Have High Rates of Skill Obsolescence Drastically Lowered the Return to Occupationally Specific Training?

It is sometimes argued that high school students should concentrate on basic skills rather than occupational skills because jobs are changing so rapidly that occupational skills learned in school soon become obsolescent. This argument is sometimes preceded by the assertion: " In the future, technological advances will come at an increasingly fast pace" (Levin and Rumberger, 1983, p. 21). In fact, however, the available evidence on changing skill requirements suggests that change is less rapid now than in the past.

Rates of job turnover, rates of exit from agriculture and overall technological progress are all lower now than in the first seven decades of the twentieth century. Separation rates in manufacturing were 5 percent per month during the 1920's and 4.4 percent during the 1970's. To be sure, the 1982 recession and the overvalued dollar have increased the number of workers being forced to change jobs and occupations. But the changes being experienced by the current generation of working adults pale by comparison to the changes experienced by the generation that lived through the depression, the mobilization for WWII and the rapid demobilization after the war. Workers have always had to learn new occupational skills.

The skill obsolescence argument against locating occupationally specific training in high schools has a number of flaws. First, obsolescence is a pervasive phenomenon. The ability to do square roots and long division by hand or on a slide rule has lost much of its value as the use of calculators has grown. Protons, electrons and neutrons are no longer considered the fundamental particles of nature. Rates of obsolescence are higher in fast changing fields and close to the frontier of knowledge. The labor market responds to high rates of skill obsolescence by paying a higher premium for the skill. The high starting salaries of engineers in part derives from the high rate of obsolescence of their skills. Consequently, there is no reason to expect a negative correlation between rates of skill obsolescence and the rate of return to an investment in a skill.

Occupational knowledge is cumulative and hierarchical in much the same way that mathematics and science is cumulative and hierarchical. There is no low cost way for people with good basic skills to become highly skilled in a specific occupation. They must generally start at the bottom of the

ladder of occupational knowledge and work their way up. New technology does require that workers learn new skills but the new skills are generally learned as small modifications of old skills. While learning a new skill is easier when the worker has good basic skills, a foundation of job knowledge and occupational skills is even more essential. New skills more often supplement old skills than supplant them. At some point every individual must start building his/her foundation of occupational skills. When the foundation building should begin is primarily a function of when the individual is able to decide which occupation to pursue.

Skills and knowledge deteriorate from non use much more rapidly than they become obsolescent. In one set of studies, students tested 2 years after taking a course had forgotten 1/2 of the college psychology and zoology, 1/3 of the high school chemistry and 3/4 of the college botany that had been learned (Pressey and Robinson, 1944). Kohn and Schooler (1978) argue that even the very basic cognitive abilities tend to deteriorate if the worker's job does not call for their use. On the other hand, skills and knowledge that are used are not forgotten. In general, forgetting is a more serious threat to knowledge and skills than obsolescence. Consequently, when deciding what to study, the probability of using a skill or knowledge base is more important than the rate of obsolescence of that knowledge.

Summary: Occupational skills become obsolescent more rapidly than basic skills and this means that vocational teachers must give high priority to keeping their curriculum and their own skills up-to-date. But differences in rates of obsolescence are not decisive considerations in choosing between an academic and a vocational curriculum. Much more important is whether the knowledge and skills gained will be remembered and used. Basic skills

are important to and used in almost all occupations and in most adult roles -- parent, citizen and consumer -- and, therefore, seldom deteriorate rapidly after leaving school. Basic skills, however, should not be confused with the content of specific academic courses. Much of this content is seldom used and quickly forgotten by those not going to college.

Since occupational skills are useful in a limited cluster of occupations, occupationally specific training needs to be conditioned on a reasonable prospect of soon working in the occupation. The reason for this conclusion is first, that the educational investment pays off only if the skills are used (see section 1); second, that skills deteriorate with lack of use; and finally that motivation to learn is weak if there is little prospect of using what is learned. Intensive occupationally specific training should begin only after a student has made a reasonably well informed tentative career choice and be for occupations with good job prospects.

8. Does Studying Occupationally Specific Skills in School Necessarily Lower Achievement in the Academic Arena?

Since the total number of courses that one can complete during high school is limited, taking vocational courses restricts the number of academic courses one can take, and vice versa. Does this mean that developing occupationally specific skills in high school implies diminished basic and academic skills? Longitudinal data are essential to address this question because it is well known that students who have done poorly in academic courses in 9th and 10th grade are more likely to choose vocational courses in the 11th and 12th grade.

Haney and Woods (1982) investigated this issue in longitudinal data on students who graduated from high school in the early 1960's and found "no support for the proposition that the basic skills learning of secondary

vocational program students is any less than that of general program students."

There have been major changes in schools and vocational education since the 1960's. Are these conclusions still valid? To address this question a study was conducted of the cohort of High School and Beyond students projected to graduate in 1982. The dependent variables were the change between sophomore and senior years in test scores, grades, career plans, key attitudinal variables such as self esteem and locus of control and an index of student deportment (Bishop, 1985). The model included extensive controls for variables that may influence both curriculum and the outcomes. These include an array of socioeconomic background variables, base year grades, test scores, and attitudinal variables, base-year educational and occupational expectations, and parents' career expectations for their children. Numerous measures of curriculum were used to assess curriculum effects, including base-year, self-reported curriculum track (vocational and academic), self-reported number of courses taken between the sophomore and senior year in a variety of subjects, and self-report regarding whether the respondent had taken algebra II, trigonometry, calculus, physics, chemistry, biology, an honors English course, and an honors math course.[11]

The results of these analyses show that curriculum does, in fact, have a strong influence on many of these outcomes, but traditional measurement of curriculum by reference to track placement does not capture these effects. The traditional track variable (self-reported membership in the academic or vocational track as employed by Haney & Woods) has little or no impact on any of the eleven outcomes (not shown). When, however, specific course descriptions are used (e.g. Algebra II, physics), the effects of taking a

college preparatory curriculum of calculus, trigonometry, algebra II, physics, and chemistry are striking (see table 3).

Holding the total number of academic courses and their distribution across fields constant, taking the 5 college preparatory math and science courses listed above raised math and science performance by 3/4 of a grade equivalent, verbal test scores by 1/3 of a grade equivalent and civics test scores by 44 percent of a grade equivalent.[12] Self esteem, deportment and occupational and educational aspirations were also raised substantially. If a student takes 3 additional year long math and science courses but avoids the more rigorous courses listed above, math test scores increase by 19 percent of a grade equivalent but verbal and civics test scores decline by an almost equal amount. Self esteem and career aspirations did not change. Deportment and educational plans improved modestly.

The results also indicate that vocational courses sometimes contribute more to the development of basic skills than watered down courses in academic subjects. Holding the academic course load constant, taking 3 full year business and office courses raised civics and verbal test scores by 15 to 20 percent of a grade equivalent. It also improved deportment, self esteem and educational plans. Taking 3 full year courses in the technical area raised math performance by 15 percent of a grade equivalent. Trade and industry courses and the residual category of vocational course had small negative effects on test score gains.

Why does taking a rigorous college preparatory curriculum in math and science have such salutary effects on a whole range of tests? The crucial difference is apparently that these college preparatory classes are more demanding than other classes. This is clearly the case in our data for the

Table 3

Change in Academic Achievement
Resulting from Modifying Curriculum

(in Percent of a Grade Level Equivalent)

Achievement on	Taking Rigorous College Prep Courses	Taking 3 Additional Courses in Math & Science	Business & Office	Technical
Verbal Test	34%***	-16%***	20%***	4%
Math Test	76%***	19%***	9%	15%**
Science Test	74%***	- 9%***	- 6%	-1%
Civics Test	44%*	-18%***	-15%**	1%
GRADE POINT AVERAGE	-.12**	- 1	.06**	.05*

Source: Entries are averages of coefficients from seperate regressions for males and females. For the four test scores, entries are coefficients scaled as a percent of a grade level equivalent under the conservative assumption that the test's standard deviation is equal to 3 grade level equivalents. The results for GPA are in percents of one point on a 4 point GPA scale. The dependent variable was the change between the end of sophomore and senior years. The models used to derive these estimates contained a total of 75 control variables. Included among the control variables were the sophomore values on the 10 other outcome measures, a great variety of specific courses, years of courses in specific subjects taken during freshman and sophomore year and during junior and senior year, family background, self-assessed ability to succeed in college, and parental pressure to attend college.

*Statistically significant at the 95 percent level.
**Statistically significant at the 99 percent level.
***Statistically significant at the 99.9 percent level.

students that took all 5 of the college preparatory classes, got significantly lower grades than those who took other courses in these fields. Apparently the key determinant of learning is the rigor of the courses taken, not the total number of academic courses or the total number of hours spent in a school building during a year.

Summary: Taking vocational courses does not inevitably reduce learning of basic skills. The effect of taking a vocational curriculum on basic skills development depends on the rigor of the academic courses that are sacrificed. If the academic courses not taken are rigorous, gains in basic and higher order academic skills during the final two years will be reduced. If the academic courses not taken are watered down, general curriculum courses, probably nothing will be sacrificed.

9. Are Occupationally Specific Skills Best Learned in a Classroom or On-a-Job?

A strong case can be made that the occupationally specific skills that many high school vocational programs are teaching in a lab or shop setting are best learned on a job. Work habits are also best learned on a job. Evidence of the great value of on-the-job learning comes from the success of the German apprenticeship system, from Hollenbeck and Wilkie's (1985) analysis of CPS data on employer provided training and from longitudinal studies of American youth.

Students who worked while in high school are generally much more successful in the labor market than those who did not. Figure 1 summarizes the results of Kang and Bishop's (1984) study of the impact of working while in high school. Holding a job during the summer between junior and senior year had large effects on wages, employment, and earnings. For boys, 30 hours of work per week during the summer between junior and senior years

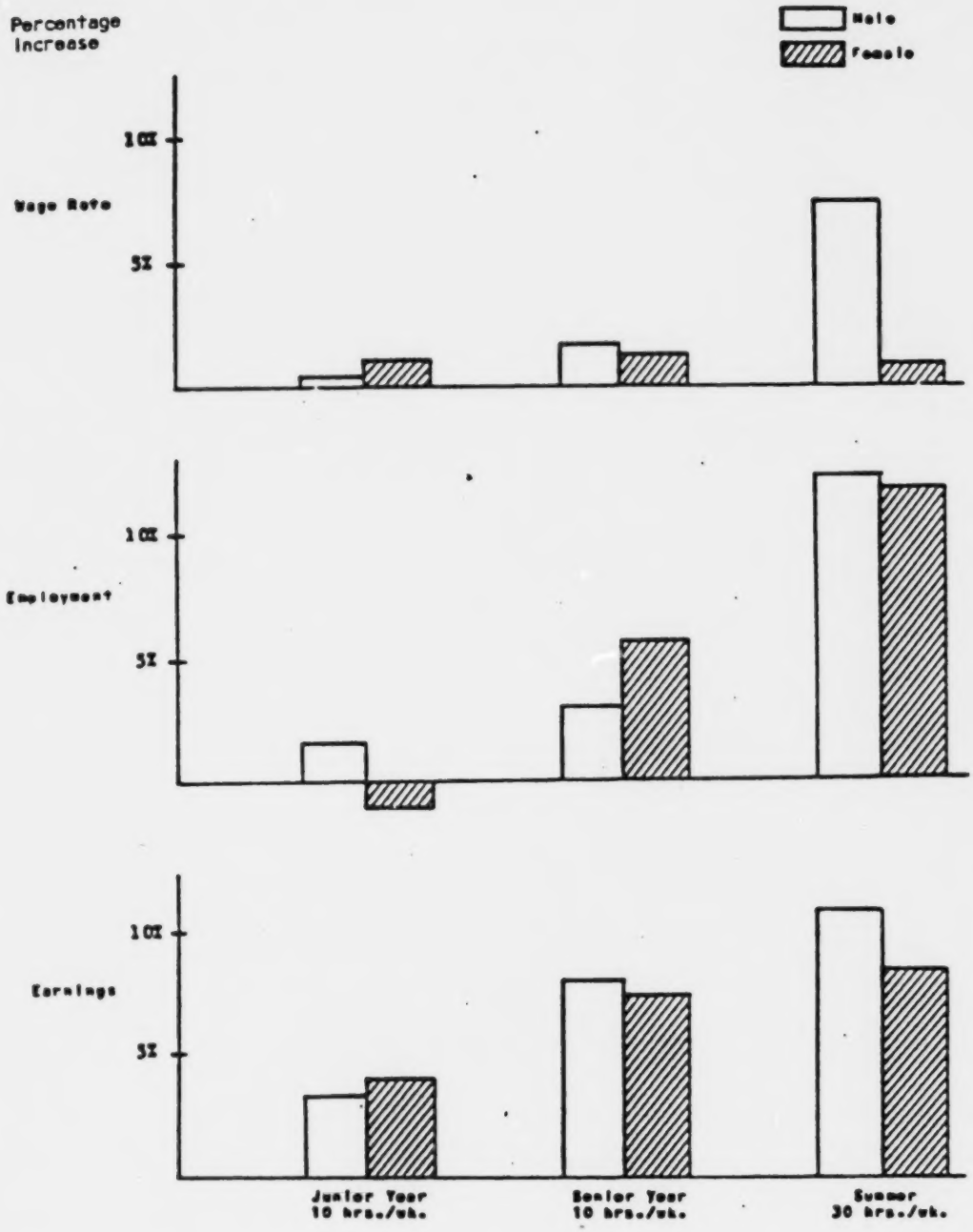

Figure 1. Effects of work during high school on labor market success in the two-year period after graduation.

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led to 8 percent higher wage rates, 12.5 percent more employment, and 11 percent higher earnings in the period immediately following high school. An equivalent total number of hours worked during the senior year (i.e., averaging 10 hours a week) raised the wage rate of boys by 1.5 percent, employment by 3 percent, and earnings by 8 percent. Holding a job during junior year in high school had practically no effect on labor market success after school. Girls who worked during summers and senior year also experienced substantial gains in employment and earnings.

The magnitude of these effects diminish over time but nevertheless remain substantial (Kang, 1984). Compared to those without work experience, those who worked 10 hours per week through the last two years in high school, earned 8 to 20 percent more in the first three months after graduation and 5 percent more during the sixteenth through twenty-first month after graduation.

Are these labor market benefits bought at the expense of any undesirable effects of having a job while in school? Greenberger and Steinmier (1981) have noted that high school students who have part time jobs during the school year are less committed to school and family and are more likely to engage in anti-social behaviors such as theft and substance abuse. They incorrectly interpret this association as evidence that part time work causes these outcomes. In fact, causation runs primarily in the opposite direction. Studies of the determinants of work while in high school have found that working during the junior and senior years is often a consequence of the student's earlier rejection of the academic goals of the school and alienation from the institution (Hotchkiss 1982, 1984).

Consequently when studying the effects of working during the school year on later academic outcomes, it is essential to use a longitudinal design

and to control thoroughly for aspirations, attitudes, grades and academic achievement measured before going to work. Hotchkiss's (1982) analysis of a longitudinal survey of Columbus high school students found that hours worked had no effect on days absent, days tardy, and grade point average. Bishop's (1985) study of changes in test scores, GPA, deportment and educational plans between sophomore and senior year of the High School and Beyond survey found small negative effects of work experience during the junior year on learning of academic material, college plans and deportment but no deleterious effect of working as a senior.[13]

When employer's provide training, it is apparently very effective. Hollenbeck and Wilkie (1985) found that training to qualify for ones current job was associated with a larger earnings gain when it was provided by a previous employer than when it was obtained at a high school. This occurred even though training provided by employers is almost always of shorter duration than high school training. Bishop (1985) found that the productivity of new employees rises by more than one third in the first three months and by more than 25 percent in the succeeding two years, and much of this productivity gain is due to the training received.

Why is employer provided training so effective? Five reasons appear to account for it. First, because employers are paying for both the trainer and the trainee's time and receive most of the benefits,they have a strong incentive to select cost effective training strategies. Second, trainees are well motivated because skills developed are almost certain to be used and promotions and pay increases go to those who do well. Third, the training is generally tutorial in nature and this is known to be an effective teaching method. Fourth, since training is generally done by supervisors, trainers

are aware of the trainee's progress and corrective instruction can be given when necessary. Finally, the trainer (not just the trainee) is held accountable for success (the training is designed to increase productivity and supervisor/trainers are held accountable for the productivity of the work group).

The problem with employer training is that there is too little of it. When the skills being developed are useful at many firms, employers are unwilling to pay for it because of the possibility the trainee will leave. Workers are forced to pay for it (by accepting a low wage during the training period), but cannot afford to invest in more than a very limited amount of general training (Bishop 1985; Hubbard and Judd 1986).

Summary: Working during summers and the senior year has large positive effects on employability and only minor deleterious effects on learning, educational aspirations and deportment. Employers appear to be more cost effective trainers than high schools. However, if vocational schools were to close, employers would be unlikely to take over the occupational training functions -- e.g. teaching typing, welding, machining and computer programming -- that schools currently assume.

PART II POLICY IMPLICATIONS

Vocational education has recently been subjected to some severe criticism. The Committee for Economic Development's blueprint for reform of public education Investing in Our Children, made the following statement:

> "Unfortunately, whether measured by future earnings, job placement, or employment success there is today little evidence that vocational education is either meeting the needs of students or of the employers who are expected to hire them." (p. 30)

Some opinion leaders are arguing that occupationally specific programs should be phased out of high schools and concentrated in postsecondary institutions.

How should vocational educators respond? It is natural to be defensive, to point out that many students have no intention of continuing in school beyond the 12th grade and that employers will not do the training the schools do not do. It could be argued further that post-secondary vocational education also has problems -- high dropout rates and unimpressive training related placement rates -- and that basic skills deficiencies cannot be blamed on vocational education because graduates spend 90% of their time during grades 1 through 12 in academic classrooms. All of these points are true but blaming others is not the solution. Many people in the field would probably agree that many students do not benefit from their vocational education as much as we would like and that some programs need to be closed or thoroughly revamped. Failures elsewhere in the educational system do not relieve us of our responsibility to maximize the benefits our students gain from the time they spend in vocational classrooms.

Who are vocational education students? Often they find academic learning difficult. Often their friends denigrate the goals of schooling and encourage the use of drugs and alcohol. If something doesn't change, they may drop out. Occupationally specific education offers these students a new forum in which to try their talents; a forum in which success is possible and effort is rewarded. A watered down curriculum that avoids failure by demanding little might attract some of these students but it would not serve them. Vocational educators know well how crucial it is for students to have pride in their accomplishments and in the occupations for which they prepare. Pride comes from succeeding at something that is difficult, from working towards a goal that is worth great effort and from being part of an exclusive group. The vocational clubs are examples of this philosophy in action.

If dropout prone students are to be persuaded to stay in school, they must be offered an opportunity to develop pride and a route to something better than a job in a fast food job restaurant. To a large degree the holding power of vocational education derives from its promise of a better job.

How then can occupationally specific education organize itself so as to better deliver on this promise? The major implications of the research reviewed in part I of this paper is that the primary outcome of occupationally specific education is occupational knowledge and skills and that the benefits of this knowledge and skills derive from their use.

It is legitimate for vocational educators to focus on imparting occupational skills and knowledge, but they cannot disclaim responsibility for whether the skills are used. Our decisions -- e.g. to start a new program, to establish competency profiles, to canvass employers for jobs -- and our competence in implementation have profound impacts on whether students get a job or training opportunity that makes use of the skills and knowledge taught. Implicitly or explicitly, we have promised our students that if they try hard, they will benefit. The research implies that the benefits of occupationally specific education are primarily economic and that they derive from using the skills and knowledge gained (see section 1, 2, 4, 5, 6 and 7). Consequently, we are morally obligated to structure the system to maximize the probability that our students get to use what they have learned either in a job or in further training.

The research discussed in section 3, 7, 8 and 9 suggests how this may be accomplished: employers need to become more involved in planning and delivering vocational education, teachers and administrators need to give greater priority to the placement function, a well informed career choice

needs to precede entry into intensive occupational training and programs need to be up to date and for occupations with strong employer demand. Pennsylvania is already moving in the right direction with its adoption of competency based instructions and a Keystone Skills Certificate. Strict new mandates regarding procedures for delivering vocational education are not desirable, however, for they are nearly impossible to enforce and are potentially counter productive because there is no single best method of serving students. What is needed most is the systematic collection of data on student outcomes and a funding system that prevents creaming yet rewards programs and teachers for achieving better student outcomes.

The remainder of the paper is devoted to a discussion of some specific policy recommendations for making vocational education more effective. They are organized under the following headings:

- Adopting performance based funding formulas which reward vocational programs for success in serving students (i.e., by raising their earnings and by placing them in jobs further related to their training).
- Adopting performance based funding formulas that prevent creaming by offering larger rewards for success with more difficult students.
- Insuring that vocational graduates have a strong basic skills foundation.
- Expanding cooperative education (students who have work experience in the occupation for which they are preparing are better able to obtain a job in that field because employers value the work experience).
- Giving considerable thought to career choice prior to the student's selecting a specific occupational program and expecting students to demonstrate genuine interest in the occupation before being admitted to a program.
- Teaching students how to search for jobs and developing a credential specifying the students competencies and accomplishments thus helping the student get a good job.

- o Expecting vocational teachers to devote more time to the placement function and rewarding them when they succeed.

Recommendations for achieving each of these 7 goals follow. Space limitations mean that some very important issues will be given only superficial consideration. Most of the program elements described below are already implemented successfully in many high schools. Among the more outstanding examples are New York's Murray Bertram High School, Chicago High School for Agriculture Sciences, Philadelphia's Academies Program and the Boston Compact.

State Funding Formulas

State governments pay a major share of the costs of vocational education and thus have a responsibility to see that this money is well spent. The effort to ensure quality by regulating the process by which vocational education is delivered has not been a success (Hoachlander, Choy and Lareau 1985). It is well known that funding formulas have powerful effects on the behavior of local administrators. When devising these formulas it is important to give greater thought to their incentive effects.

The wrong incentives are generated by formulas for state reimbursement of the costs of occupational education that are based upon October enrollments or average daily attendance. The aid received by the district is unrelated to the effectiveness of its programs.[14] Success in recruiting students into the program is rewarded rather than success in serving the student. Since the primary demonstrated benefits of vocational education are economic and derive from using the occupationally specific skills taught in school, it is appropriate for funding formulas to reward programs which do a better job of raising earnings of their graduates, of placing them in jobs or further schooling related to their training and of developing workers who are praised

and appreciated by their employers.[15] Since dropout prevention is another important benefit of vocational education, it is also appropriate for the formula to reward programs which lower the dropout rates of high risk students most dramatically.[16]

State reimbursement formula should be based on outcomes not inputs and on students not programs. The formula should promote the revamping or discontinuation of programs that do not place a respectable number of graduates in jobs or further education related to the training, raise the earnings of program graduates above those of comparable nonvocational students or achieve some mix of well defined economic and educational goals.

One of the concerns that has been expressed about performance standards is that it may encourage creaming. This can be avoided, however, by devising a formula that offers larger rewards for success in serving more challenging students: the learning disabled and those at high risk of dropping out. Since teachers quite naturally prefer to teach intelligent, well-behaved, motivated students, there will always be pressure to cream.[17] Only powerful counter incentives can overcome the natural tendency to cream. State funding formulas can be such a counter incentive if they offer larger reimbursements for success with more challenging students -- the handicapped and those with poor grades in previous grades. If, for example, local districts received $2000 for graduating and placing students scoring in the bottom quartile on standardized tests taken in ninth grade, but only $800 for graduating and placing students scoring in the top half of the test, a very powerful incentive would exist to seek out and serve the students for whom success is not assured.

The second feature of the proposed performance standards that would

counteract existing incentives to cream is that reimbursement would not be based on the rate of the training related placement or on the average earnings gains, but rather on the number of training related placements or the average earnings gain times the number graduated. Teachers and counselors would thus face incentives to recruit/admit into vocational education all students who they feel they can help.

When outcomes like training related placements are part of the formula, adjustments would also need to be made for the intensity of demand in the local labor market. Since placements are much more difficult to arrange when the labor market is bad, dollar reimbursements per placement would need to be higher when local unemployment rates are high.[18] Formulas should also be adjusted for fields of study to reflect differences in goals, costs of instruction, and market conditions (e.g., expected rates of training related placement might be higher for distributive education and for office education).

One potential objection to suggestions that funding allocations be based on success in training related placement is that the figures currently reported to state departments of vocational education are not comparable across districts and programs, are subject to manipulation and suffer from a nonresponse problem. However, there is no reason why a more reliable reporting system cannot be developed. Pennsylvania's computerized wage reporting system for workers covered by unemployment insurance provides information on the name, address and industry of the student's employer. Estimates of the earnings impact of vocational rather than a general education can be obtained rather easily from this data base. It can also be the starting point of a followup system providing a valid count of

graduates who have training related jobs.[19]

A Strong Basic Skills Foundation

Clearly almost everyone needs to be able to reason, solve problems and communicate both verbally and in writing (see section 6). Elementary/secondary education needs to place the highest priority on developing these abilities. The responsibility for achieving these objectives probably should not rest with English and math teachers alone; history, art and vocational teachers should reinforce (i.e., demand) basic skills as well. In fact, however, vocational courses are often not organized in a way that requires students to employ basic skills. Students in vocational classrooms spend only 3 to 7 percent of their time applying basic skills to learning vocational skills (Halasz and Behm 1983, Halasz, Behm, and Fisch 1984).[20] When these findings have been presented to vocational teachers, their reaction has often been "it is not my responsibility." (Halasz, personal communication). Time on task findings and teacher reactions would probably be similar in art, health, science and many other courses. These attitudes should be changed. The newly developed principles of technology courses are a positive development but not sufficient on their own. Vocational students should be expected to learn some of their occupational skills from printed material. Verbal explanations and visual demonstrations by the teacher should not be the only mode of instruction. Vocational students need to get practice explaining job tasks to others and writing out instructions, for career advancement will depend on their ability to teach as well as on their skills and learning ability.

The total number of academic courses taken does not matter nearly as much as the standards and content of courses that are taken (see section

8). Legislated increases in the number of academic courses required for graduation will increase achievement only if the standards and content of the courses taken are upgraded. Merely taking more academic courses does not increase academic achievement. In order to develop the skills that will be essential for later advancement, vocational students should be encouraged to take the more demanding math and science courses that they often avoid. In some technical fields, courses in chemistry, physics, algebra and trigonometry might be a required part of the curriculum.

Cooperative Education

About one sixth of the nation's high school vocational students now participate in cooperative education. The research discussed in Section 9 suggests that it needs to be expanded. Most vocational students should have coop jobs during summers and the final year of occupational training. Exceptions might have to be made in rural communities in which a large share of the students leave the community after graduating or for programs that feed their graduates into training programs at a postsecondary institution. (For a fuller description of the rationale of coop education see Ruff et al. 1982; Lewis and Fraser 1982; and Barton 1981).

One of the barriers to greater numbers of students participating in cooperative education is the difficulty of earning the required number of academic credits while holding down a job during school hours. Ways need to be found to lower this barrier. One approach would be to schedule coop jobs outside of school hours. Certainly some way of compensating teachers for supervision outside of normal hours can be found. Jobs that must be scheduled during school hours could be accommodated by holding special coop classes outside of normal school hours.

There will be no difficulty finding coop placements for clerical and distributive education students. Placing health, trades and technical students may be difficult, however.[21] In order to help place these students and insure that the jobs really offer training, coop staff should facilitate applications for learners waivers which allow coop students to be paid 75 percent of the minimum wage. The training costs in these jobs are significant and the lower wage during the training period is justified. In Germany, for example, first year apprentices are generally paid only one fourth of what they will make when the apprenticeship is completed. Paying below the minimum wage in the training slots is also desirable because it insures that the students are in the program because of the opportunities to learn a skill rather than just to earn money and get out of school.

In many of the best coop programs teachers and employer advisory committees devise a list of competency objectives for each field and agree on how to divide the responsibility for teaching these skills. The coop contract would specify the competencies the employer is to teach. The student would receive a competency profile checklist at the beginning of the program and the competencies developed would be recorded on this document as they are learned. The competency profile would also serve as a credential that assists in the placement of students in jobs and further training.

Counseling Before Entry into Occupationally Specific Programs

A great deal of counseling and thought should precede the student's choice of an occupationally specific vocational training program. Where possible and appropriate, career exploration courses should be available to 9th and 10th graders considering entry into occupationally specific training. Courses need to be specially designed with this purpose in mind.

Skill instruction and hands on experience with the tools and materials of a craft are valuable but this needs to be supplemented by visits to work sites and the opportunity to interview and shadow workers in a variety of jobs in the field. High school labs and shops do not by themselves provide a good preview of what a particular line of work is like.

An individualized employability plan should be developed jointly by school staff and students considering entry into occupational (as distinct from exploratory) vocational courses. For students considering an occupational specialty this process should include the following steps:

- disclosure of the past record of each vocational program in placing graduates in training related jobs or further education and the wages and other characteristics of the jobs obtained.

- student participation in a systematic career selection program.

- student investigation of the occupation through taking a part-time job or interviewing and shadowing people who work in the field. The student should be expected to write an essay about this experience and explain why he/she wants to prepare for this occupation.

- conferences with a guidance counselor on the issue of career choice and curriculum that include both the student and his parents.

- development of an employability plan for/with the student which would result in a "contract" being signed between students, parents, vocational teacher, the school and employer representatives. The student would need to state an intent to seek employment or further training in the field after graduating and agree to complete a certain number of courses in the field and to try to achieve a particular standard. The school and employer representatives would promise to find the student a coop placement and a training related job after graduation when the student achieves the agreed standard.

Programs with high placement rates and heavy demand should be expanded but where excess demand exists the strength of a student's commitment to

a particular occupation should be an important consideration in choosing which students are admitted.[22] Motivation and grades in courses that prepare one for the field might also be considered. Even where everyone who applies is admitted, it is desireable to project an image of selectivity because it prevents vocational students from being stigmatized and instills pride in the chosen field and a commitment to excel.

Screening students for interest might initially reduce the number of students in occupationally specific educational programs. But if it succeeds in raising the esprit of the students in occupational programs and the payoff to their training, the high standards can be expected to attract additional students into the field just as they have been attracted to the magnet high schools of New York, Chicago and many other cities.

Aiding Students in Their Search for Work

Instruction in Job Search. During the first year of a vocational program at least 5-10 hours of class time should be devoted to how to search for work and how to make a good impression in an interview. One of the elements of this training should be videotape feedback of practice job interviews.

Graduating seniors who have not found a job at least a few weeks before graduation should participate in a job search club during their final couple of weeks. The school would need to provide a bank of phones and excuse students from school when they succeed in arranging an interview.

Job-Search Portfolio. Schools should provide students with a "Job-Search Portfolio" or competency profile that records all their accomplishments in one place (their GPA, awards for attendance and achievement, jobs, extra curricular activities, etc). The Keystone Skills Certificate is clearly a step in this direction and would be an integral part of a job search

portfolio. Students attempting to market themselves to employers will have greater success if all their school achievements are summarized in one compact standardized document. Brevity and standardization make it easier for employers to use information on school performance and achievements in their hiring decisions and this will help students get good jobs.[23]

Seeking Hiring Commitments from Local Employers Vocational teachers and school administrators should seek commitments from large local employers to give preference to graduates of the vocational program or to offer a job to one or more of the program's graduates. Uncertainty about demand makes firms reluctant to make such advance commitments, but it has been done in some cities such as Boston. These jobs might be structured as fellowships; students would compete for them and the individual selected would be announced as the winner of the First Bank of _____ Training Fellowship at the school's awards assembly. Hopefully enough commitments could be obtained so that all vocational graduates would receive a "fellowship".

Rewarding Successful Placement

The vocational teacher, not a placement director, should be responsible for placing his/her students. McKinney et al, (1982) found that schools with placement officers actually had lower training related placement rates than schools which did not. Leaving the responsibility for placement with the vocational teacher forces more involvement with local employers and helps to foster a mentorship relationship between teacher and student.

Teachers should assist their students, current graduates and past graduates to find training related jobs and their success in this area should be evaluated and rewarded. (They might receive $100 for each time they find a training related job for a recent graduate and $100 for each year beyond

the first year the student stays in that job.) Larger awards might be made for placing handicapped students.

Vocational teachers should be expected to keep in touch with former students over the phone. They should keep records of each student's employer, wage rate, future plans, a detailed description of the student's job, the OJT being received, and of the skills taught in school that are being used on the job (matched against the student's competency profile). During these conversations the teacher could ask for suggestions about what additions to or deletions from the curriculum should be made. These conversations would identify which graduates need assistance in finding training related jobs and might also yield job leads for new coop placements and for other graduates.

Rewarding teachers for placing their graduates in a job or further schooling that is training related is appropriate because the necessary outreach work takes time and deserves compensation, and because an incentive to devote time to the task is necessary. It is, however, also a reward and incentive for setting high standards in the classroom and being an effective teacher, for high training related placement rates are much easier to achieve when past graduates have done well on the job and the program has developed a reputation for quality.

Rates of placement in jobs or further schooling related to the training should not be the only outcome measure used in evaluating vocational teachers. Employer satisfaction with graduates, the wage levels of the jobs obtained, scores on competency exams and direct evaluations of teaching quality should also be employed.

7. Closing Remarks

Until new evidence of unique educational effects of vocational education is produced, the primary justification of occupationally specific education must remain an economic one. It must make the students better off economically: either by increasing the probability of graduating or improving employment chances after graduating. Making the vocational students no worse off is not good enough. If the economic effects of taking academic and occupational courses in school were equal, the public would probably want to substitute academic for occupational course work. Their preference for the academic has a rational base:

- academic courses are less costly to teach (because class sizes are larger and space and equipment needs smaller)
- employers expect to teach occupational skills to new hires who have not received training in high school but they are unlikely to teach the material covered in academic courses.
- academic course work is better preparation for college than occupational course work so choosing an occupational curriculum inevitably reduces the ability of the student to change his/her mind about college and later go for a B.A.
- the public's educational goals are in part cultural and political and nonvocational courses make greater contributions to these goals.
- basic skills do not become obsolescent while occupational skills do.

Raising the proportion of graduates who use the occupational skills taught needs to receive very high priority. Teachers and programs need to be evaluated on the basis of the number of graduates who get a job or continue their education in the field. Employers should become more involved in delivering occupational training. Teachers should no longer be sole instructors for occupation specific skills. Where feasible coop employers

might become the primary instructors for these skills. The teacher's role would become one of mentor and facilitator of learning and job placement, and the role would not terminate when the student graduates. Much more would be expected of vocational teachers, so it would probably be necessary to increase the teacher-student ratio. New funds would need to be committed to vocational education but the extra money should be distributed as rewards for results -- not as reimbursement for increased expenses. State mandated procedural requirements seldom work. Local administrators and teachers inevitably have the ultimate responsibility. The resources they need to implement reform should come from a generous performance based funding formula.

FOOTNOTES

1. One has to be in the labor force at least one week to be in a training related job, so the association between the two reflects both directions of causation.

2. All published estimates of the impacts of vocational education (including the estimates of the impact of vocational education that results in a training related job) are potentially subject to selection bias. Even though these estimates are made while controlling for all measurable background characteristics, it is possible that there is some unmeasured personality trait that (a) existed prior to entry into vocational education (b) is stable and (c) has important effects on both the outcomes studied and the probability of participation in vocational education or of finding a training related job. We could, of course, be more confident of our estimates of the impacts of vocational education if they were based on an experimental design, but in the absence of such experiments policy decisions must be based on the high quality nonexperimental longitudinal studies that are available. Selection bias probably exaggerates the effect of training relatedness but the magnitude of the bias is likely to be small relative to the estimated coefficient.

3. The analysis makes use of data on 550 pairs of recently hired workers employed in the same or a very similar job at 550 different firms. The following model was estimated:

$$Y_1 - Y_2 = A\,(D_1-D_2) + B\,(X_1-X_2)$$

where

Y_1-Y_2 = is the difference between the productivity or required training of person 1 and person 2

D_1, D_2 = a dummy indicating that person 1 or 2 had obtained vocational training from a school that was relevant to the job for which he/she was hired

X_1, X_2 = a vector of control variables for circumstances of the hire, and the new hires other credentials. When current productivity is Y, tenure and tenure squared are included in the X's.

4. When a less rigorous definition of training relatedness is used (e.g. one based on questions like "On your present job, how much do you use the vocational training you received in high school or area vocational center?" Bice and Brown, 1973), more than half of vocational graduates report using their training. This implies that 25 to 50% of all vocational graduates report making some use of their vocational education even though there is no match between their occupation and their training. The Campbell et al (1986) study implies that the amount of carryover is probably quite small, for these graduates were treated

as having an unrelated job and the overall wage impact of vocational education for those with an unrelated job was close to zero.

5. The U.S. rate of training related placement might have been somewhat higher if measured 6 months after high school graduation but if the German definitions of relatedness had been applied to the U.S. data, the training related placement rate would have been even lower. High unemployment rates no doubt contribute to the low rates of training related placement in the U.S. However, aggregate unemployment rates are now equally high in Germany so the differential between the countries in training related placement cannot be attributed to differentials in the general tightness of labor markets.

6. If asked by someone other than the employer, some school officials might have defended their policy on the grounds poor students will not be considered if the employer learns of this fact. What they don't realize is that the policy results in no recent graduates (whether good or poor student) getting a really good job. In effect they are saying the interests of our bad students and discipline problems should take precedence over the interests of the students who lived by the schools rules and studied hard. There is nothing unfair about letting high school GPA's influence the allocation of young people to jobs. The GPA's are an average which reflects performance on 100's of tests, and the evaluations of over 20 teachers based on over 700 days of interaction. Selection decisions must be made somehow. If transcripts are not available, the hiring selection will be determined by the chemistry of a job interview (which research has demonstrated "are of little value in the selection situation, Mayfield, 1964) and the idiosyncratic recommendation of a single previous employer.

7. The study derived a 4 factor representation of job satisfaction from a factor analysis of a battery of the job satisfaction questions in the NLS youth data base and then analyzed the effects of vocational education in high school on these 4 dimensions of job satisfaction. Neither taking vocational courses nor finding a training related job appeared to have a significant impact on job satisfaction. Two years of data were studied and 3 modes of participation and 4 kinds of job satisfaction were defined so the hypothesis that vocational education improves job satisfaction was tested 24 different times. Only two of these coefficients were statistically significant at the .05 level, barely more than what would be expected by chance. Only one of the eight coefficients testing the impact of having a training related job was statistically significant (Campbell et al, 1982, Appendix tables E-1 to E-4).

8. Most of the research used supervisory ratings as the criterion of performance but the basic finding is, in fact, strengthened when better work sample measures of performance are employed.

9. These test validities are calculated by dividing observed correlations between the tests and supervisor reports of job performance by the known reliabilities of the tests and the criterion.

10. Only their cross tabular results are reported because the unreliability of the pretests caused the regression analysis to produce biased estimates of curriculum effects. The regression analysis of HSB data reported below avoided this problem by not including a baseline test score on the right when its gain scores is the dependent variable.

11. These courses were selected from a more complete list of courses to represent math and science course work generally taken during or after the sophomore year in high school. The specific model estimated was:

$$Y_{it} - Y_{it-1} = BX_{it-1} + \phi C + \theta Y_{j \neq i, t-1} \qquad \begin{matrix} i = 1....11 \\ j = 1....11 \end{matrix}$$

where

Y_{it} = the "i"th outcome variable measured at the end of senior year. (e.g. math test score)

Y_{it-1} = the sophomore year measure of the "i"th outcome variable

$Y_{j \neq i, t-1}$ = a vector of sophomore year measures of outcome variables other than the "i"th

X_{it-1} = a vector of variables characterizing background and curriculum course-work variables measured in the sophomore year

C = a vector of variables describing the courses taken in junior and senior year

ϕ = a vector of coefficients measuring the impact of course work on learning and career aspirations

12. Estimates of impact in terms of grade equivalents were made making the conservative assumption that at the 12th grade one standard deviation on the HSB tests was equivalent to 3 grade equivalents.

13. These results come from estimating the regression models described in footnote 11.

14. If students are able to evaluate program quality and avoid programs judged of low quality, enrollment based funding will reward quality. Students, however, are not well informed about program quality, they may not care about quality and their commitment to a particular occupation may be so strong they will stick with it even if the teacher is doing a poor job. An additional problem is that student enrollment choices may be manipulated by teachers with quotas to fill. Especially

perverse incentives arise when occupational programs must have some minimum enrollment to receive state funds. Teachers in need of bodies to meet the target are often willing to accept and sometimes actively recruit into their program students who they know do not want or have only a low probability of getting a job in the field.

15. The use of training related placement rates in reimbursement formulas is clearly feasible for it has been implemented in two states, Florida and South Carolina. JTPA's performance standards also have many similarities to what is being proposed here. Tennessee funds it's state colleges and universities in part through a performance incentive system (Bogue & Brown, 1982).

16. The outcomes included in the formula would not have to be limited to economic outcomes. Other indicators might also be employed such as: checklists of competencies attained, numbers of participants in skill olympics and the average rating of the submissions, completions of more advanced training by program graduates, evaluations by the teachers in these postsecondary programs, and scores on occupational competency exams or state licensing exams.

17. Reputations of teachers and programs are influenced by absolute levels of student performance -- contests won, houses well constructed, and good jobs obtained. Value added -- saving students who were headed for failure -- is much harder to assess. Attention goes to the students who fail rather than the ones who graduate and find a job despite handicaps or a disadvantaged background. Not surprisingly teachers compete for the opportunity to teach the better students. All of these factors create incentives to cream -- to recruit the most able and screen out those with learning problems or a bad attitude.

18. A funding formula that simultaneously adjusts for a student's entering ability and for the condition of the local labor market is not difficult to devise. Assuming an average payment per training related placement of $1000, the payment (R) might be set at.

$$R = \$1000 - \$350 \text{ (Z score)} + \$100 \text{ (Unemp Rate } -6)$$

where Z score is the student's score on a nationally normed tests given in ninth grade measured in standard deviation units. Each criterion used would need its own set of adjustment factors. Performance based funding formulas are feasible for general education as well.

19. In many cases the match between the industry and the field of training will be so close that a training related placement can be assumed without the necessity of a follow up. Where the nature of the job is not clear from the industry code, a card could be sent to the employer requesting a description of the employee's job and possibly also asking for an evaluation of the training the employee had received. If no response is received from the card, an independent survey firm could be contracted to telephone the employer. Where no match turned up in the system, an effort could be made to call the student's parents. The list of

students and their job classifications would be sent to the vocational teacher and the school district. This would give the teacher the opportunity to appeal and correct mis-classifications.

20. Basic skills time was defined as the use of reading, mathematics and both oral and written communication skills by students in a vocational class. Examples were reading, writing, speaking or calculating in conjunction with technical skills.

21. Employers who train handicapped and disadvantaged youth are eligible for targeted jobs tax credits. The coop coordinator should aggressively market these tax credits as a way to induce employers to train the students who are most difficult to place.

22. Local districts might be given the option of allowing students who have not signed a contract and who do not have career plans in the field to take vocational courses along side of the "contract" students. But only "contract" students should be allowed to use vocational courses to satisfy up to 3 Carnegie units of core academic requirements. These students would not be reimbursable from state vocational education funds.

23. The coverage and format of the document is probably best worked out cooperatively by a committee of school personnel, employers and parents. Developing and implementing such a document might be a part of a campaign to enlist commitments from major local employers to give the recent graduates of local high schools some hiring preference. Students have many talents and skills that can be highlighted in such a document. The job-search portfolio would include the GPA but would also emphasize other performance indicators and accomplishments that are useful in identifying a good match between a job and youth. The student and the parents would receive copies of it and students and graduates would be encouraged to bring a copy with them when they apply for jobs. Employers would be encouraged to ask to see the portfolio and attach a xerox copy to the job application filed by the student or graduate.

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